WE CLAIM:

1. A method of extending a data service through a broadband packet network, the method comprising steps of:

   a) receiving a data stream respecting the data service at an ingress gateway;

   b) encapsulating the data stream within a container;

   c) encapsulating the container within a protocol data unit (PDU) of the broadband packet network; and

   d) forwarding the PDU through the broadband packet network to an egress gateway.

2. A method as claimed in claim 1, wherein the step of encapsulating the data stream comprises the steps of:

   a) accumulating a payload packet comprising a predetermined number of accumulated bytes of the data stream; and

   b) encapsulating the payload packet within the container.

3. A method as claimed in claim 1, wherein the broadband packet network is based on any one or more of the UDP/IP, TCP/IP, IP-MPLS, ATM, Ethernet and DOCSIS protocols, and the data stream is formatted in accordance with any other communications protocol.

4. A method as claimed in claim 2, wherein a communications protocol of the data stream is known.

5. A method as claimed in claim 4, wherein the predetermined number of bytes of the data stream forming each payload packet is a function of the format of the data stream.

6. A method as claimed in claim 5, wherein the data stream is a circuit-switched data stream comprising pulse code modulated PCM signals, and the number of accumulated bytes forming each payload packet is determined by a number of channels and number of multi-frames of the data stream.

7. A method as claimed in claim 6, wherein the number of accumulated bytes forming each payload packet is equivalent to

$$Ps = (Nc \times Nm) \times n$$

Where: Ps = payload packet size;

Nc = number of channels;

Nm = number of frames; and

n = an integer.

8. A method as claimed in claim 4, wherein the data stream is a packet data stream comprising sequential PDU's of a packet network protocol.

9. A method as claimed in claim 8, wherein the number of bytes forming each payload packet is an integer multiple of a number of bytes forming each PDU of the packet network protocol.

10. A method as claimed in claim 2, wherein a communications protocol of the data stream is unknown.

11. A method as claimed in claim 2, wherein the step of accumulating a payload packet comprises steps of:

a) detecting an idle pattern; and

b) when an idle pattern is detected, discarding bytes of the data stream corresponding to the detected idle pattern.

12. A method as claimed in claim 11, wherein the idle pattern in known.

13. A method as claimed in claim 12, wherein the idle pattern is embedded within the data stream, and the step of detecting the idle pattern comprises a step of monitoring successively received bytes of the data stream to detect the idle pattern.

14. A method as claimed in claim 12, wherein idle pattern is indicative of an idle channel within the data stream, and the step of discarding bytes of the data stream comprises a step of discarding bytes within the indicated idle channel of the data stream.

15. A method as claimed in claim 12, wherein the idle pattern is a stimulus external to the data stream.

16. A method as claimed in claim 12, further comprising a step of forwarding an idle notification to the egress gateway, the idle notification comprising information

identifying detected idle patterns and corresponding idle channels.

17. A method as claimed in claim 16, wherein the notification is forwarded within the container.

18. A method as claimed in claim 16, wherein the notification is forwarded within a notification message independently of the container.

19. A method as claimed in claim 11, wherein the idle pattern in unknown.

20. A method as claimed in claim 19, wherein the step of detecting the idle pattern comprises a step of monitoring each successive payload packet to detect a repeating pattern indicative of an idle condition of the circuit-switched data stream.

21. A method as claimed in claim 20, wherein the step of discarding bytes of the circuit-switched data stream comprises a step of discarding each successive payload packet in which the repeating pattern is detected.

22. A method as claimed in claim 21, further comprising steps of:

a) interrupting the steps of encapsulating payload packets within containers, encapsulating containers within PDUs and forwarding the PDUs to the egress gateway; and

b) sending an idle notification to the egress gateway.

23. A method as claimed in claim 22, further comprising steps of:

a) continuing to monitor successive payload packets to detect the repeating pattern; and

b) resuming the steps of encapsulating payload packets within containers, encapsulating containers within PDUs and forwarding PDUs to the egress gateway when the repeating pattern is no longer detected.

24. A method as claimed in claim 2, further comprising a step of inserting a sequence number into each successive container.

25. A method as claimed in claim 24, wherein at least one sequence number is a reserved sequence number used to indicate a start of the data stream.

26. A method as claimed in claim 1, further comprising steps of:

a) receiving sequential PDUs of the broadband packet network at the egress gateway from the ingress gateway;

b) extracting a respective container from each received PDU; and

c) reconstructing the data stream using the respective containers.

27. A method as claimed in claim 26, wherein the step of reconstructing the data stream comprises steps of:

a) buffering each container in a jitter buffer;

b) extracting a respective payload packet from each container; and

c) appending each extracted payload packet to a payload packet of a previous container to reconstruct the data stream.

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28. A method as claimed in claim 27, further comprising a step of sorting the buffered containers based on a respective sequence number of each container.

29. A method as claimed in claim 28, further comprising a step of monitoring the respective sequence numbers of each buffered container to detect a missing container.

30. A method as claimed in claim 29, further comprising, in respect of each detected missing container, a step of appending a null payload packet to a previous payload packet of the reconstructed data stream.

31. A method as claimed in claim 30, wherein the null payload packet comprises AB-bits duplicated from the previous payload packet of the reconstructed data stream.

32. A method as claimed in claim 27, further comprising a step of

a) monitoring an inter-packet delay period between successively received PDU's; and

b) adjusting a length of the jitter buffer based on the inter-packet delay.

33. A method as claimed in claim 32, wherein the length of the jitter buffer is adjusted during an idle period of the data stream.

34. A method as claimed in claim 26, wherein the step of reconstructing the data stream further comprises a step of receiving an idle notification from the ingress gateway.

35. A method as claimed in claim 34, wherein the idle notification comprises information identifying one or more of an idle indication and a corresponding idle channel of the data stream received by the ingress gateway, and the step of reconstructing the data stream further comprises a step of inserting null data into the corresponding idle channel of the reconstructed data stream following receipt of the idle indication.

36. A method as claimed in claim 35, wherein the null data includes the idle indication.

37. A method as claimed in claim 34, wherein the idle notification comprises an indication of an idle condition of the data stream received by the ingress gateway, and the step of reconstructing the data stream comprises any one or more of duplicating a

last received payload packet, and inserting a provisioned idle pattern.

38. A method as claimed in claim 34, wherein the notification is received by the egress gateway encapsulated within a container.

39. A method as claimed in claim 34, wherein the notification is received by the egress gateway within a notification message independently of a container.

40. A method as claimed in claim 34, further comprising a step of resuming reconstruction of the data stream based on containers extracted from received PDU's upon receipt of a container having a predetermined reserved sequence number.

41. An apparatus for extending a data service through a broadband packet network, the apparatus comprising:

a) means for receiving a data stream respecting the data service at an ingress gateway;

b) means for encapsulating the data stream within a container;

c) means for encapsulating the container within a protocol data unit (PDU) of the broadband packet network; and

d) means for forwarding the PDU through the broadband packet network to an egress gateway.

42. An apparatus as claimed in claim 41, wherein the means for receiving a data stream respecting the data

service comprises an interface adapted to convey the data stream from a source to the ingress gatway.

43. An apparatus as claimed in claim 41, wherein the means for encapsulating the data stream comprises:

a) means for accumulating a payload packet comprising a predetermined number of accumulated bytes of the data stream; and

b) means for encapsulating the payload packet within the container.

44. An apparatus as claimed in claim 41, wherein the broadband packet network is based on any one or more of the UDP/IP, TCP/IP, IP-MPLS, ATM, Ethernet and DOCSIS protocols, and the data stream is formatted in accordance with any other communications protocol.

45. An apparatus as claimed in claim 44, wherein a communications protocol of the data stream is known.

46. An apparatus as claimed in claim 45, wherein the predetermined number of bytes of the data stream forming each payload packet is a function of the format of the data stream.

47. An apparatus as claimed in claim 46, wherein the data stream is a circuit-switched data stream comprising pulse code modulated (PCM) signals, and the number of accumulated bytes forming each payload packet is determined by a number of channels and a number of multi-frames of the data stream.

48. An apparatus as claimed in claim 47, wherein the number of accumulated bytes forming each payload packet is equivalent to

$$Ps = (Nc \times Nm) \times n$$

Where: Ps = payload packet size;

Nc = number of channels;

Nm = number of frames; and

n = an integer.

49. An apparatus as claimed in claim 45, wherein the data stream is a packet data stream comprising sequential PDU's of a packet network protocol.

50. An apparatus as claimed in claim 49, wherein the number of bytes forming each payload packet is an integer multiple of a number of bytes forming each PDU of the packet network protocol.

51. An apparatus as claimed in claim 44, wherein a communications protocol of the data stream is unknown.

52. An apparatus as claimed in claim 43, wherein the means for accumulating a payload packet comprises:

a) means for detecting an idle pattern; and

b) means responsive to detection of an idle pattern and adapted to discard bytes of the data stream corresponding to the detected idle pattern.

53. An apparatus as claimed in claim 52, wherein the idle pattern in known.

54. An apparatus as claimed in claim 53, wherein the idle pattern is embedded within the data stream, and the means for detecting the idle pattern comprises means for monitoring successively received bytes of the data stream to detect the idle pattern.

55. An apparatus as claimed in claim 53, wherein idle pattern is indicative of an idle channel within the data stream, and the means for discarding bytes of the data stream comprises means for discarding bytes within the indicated idle channel of the data stream.

56. An apparatus as claimed in claim 53, wherein the idle pattern is a stimulus external to the data stream.

57. An apparatus as claimed in claim 53, further comprising means for forwarding an idle notification to the egress gateway, the idle notification comprising information identifying detected flags and corresponding idle channels.

58. An apparatus as claimed in claim 57, wherein the notification is forwarded within the container.

59. An apparatus as claimed in claim 57, wherein the notification is forwarded within a notification message independently of the container.

60. An apparatus as claimed in claim 52, wherein the idle pattern in unknown.

61. An apparatus as claimed in claim 60, wherein the means for detecting the idle pattern comprises means for monitoring each successive payload packet to detect a repeating pattern indicative of an idle condition of the circuit-switched data stream.

62. An apparatus as claimed in claim 61, wherein the means for discarding bytes of the circuit-switched data stream comprises means for discarding each successive payload packet in which the repeating pattern is detected.

63. An apparatus as claimed in claim 62, further comprising:

a) means for interrupting encapsulation of payload packets within containers, encapsulating containers within PDUs and forwarding the PDUs to the egress gateway; and

b) means for sending an idle notification to the egress gateway.

64. An apparatus as claimed in claim 63, further comprising means for resuming the encapsulation of payload packets within containers, encapsulation of containers within PDUs and forwarding of PDUs to the egress gateway when the repeating pattern is no longer detected.

65. An apparatus as claimed in claim 43, further comprising means for inserting a sequence number into each successive container.

66. An apparatus as claimed in claim 65, wherein at least one sequence number is a reserved sequence number used to indicate a start of the data stream.

67. An apparatus for extending a data service through a broadband packet network, the apparatus comprising:

a) means for receiving sequential PDUs of the broadband packet network at an egress gateway from an ingress gateway;

b) means for extracting a respective container from each received PDU; and

c) means for reconstructing a data stream respecting the data service using the respective containers.

68. An apparatus as claimed in claim 67, wherein the means for reconstructing the data stream comprises:

a) a jitter buffer adapted to buffer each container;

b) means for extracting a respective payload packet from each buffered container; and

c) means for appending each extracted payload packet to a payload packet of a previous container to reconstruct the data stream.

69. An apparatus as claimed in claim 68, further comprising means for sorting the buffered containers based on a respective sequence number of each container.

70. An apparatus as claimed in claim 69, further comprising means for monitoring the respective

sequence numbers of each buffered container to detect a missing container.

71. An apparatus as claimed in claim 70, further comprising, means for appending a null payload packet to a previous payload packet of the reconstructed data stream in respect of each detected missing container.

72. An apparatus as claimed in claim 71, wherein the null payload packet comprises AB-bits duplicated from the previous payload packet of the reconstructed data stream.

73. An apparatus as claimed in claim 68, further comprising:

a) means for monitoring an inter-packet delay period between successively received PDU's; and

b) means for adjusting a length of the jitter buffer based on the inter-packet delay.

74. An apparatus as claimed in claim 73, wherein the length of the jitter buffer is adjusted during an idle period of the data stream.

75. An apparatus as claimed in claim 67, wherein the means for reconstructing the data stream further comprises means for receiving an idle notification from the ingress gateway.

76. An apparatus as claimed in claim 75, wherein the idle notification comprises information identifying one or

more of an idle indication and a corresponding idle channel of the data stream received by the ingress gateway, and the means for reconstructing the data stream further comprises means for inserting null data into the corresponding idle channel of the reconstructed data stream in response to receipt of the idle indication.

77. An apparatus as claimed in claim 76, wherein the null data includes the idle indication.

78. An apparatus as claimed in claim 75, wherein the idle notification comprises an indication of an idle condition of the data stream received by the ingress gateway, and the means for reconstructing the data stream comprises means for duplicating a last received payload packet in response to receipt of the idle notification.

79. An apparatus as claimed in claim 75, wherein the notification is received by the egress gateway encapsulated within a container.

80. An apparatus as claimed in claim 75, wherein the notification is received by the egress gateway within a notification message independently of a container.

81. An apparatus as claimed in claim 75, further comprising means for resuming reconstruction of the data stream based on containers extracted from received PDU's upon receipt of a container having a predetermined reserved sequence number.

82. A system for extending a data service through a broadband packet network, the system comprising:

a) an ingress gateway comprising:

i) means for receiving a data stream respecting the data service;

ii) means for encapsulating the data stream within a container; and

iii) means for encapsulating the container within a protocol data unit (PDU) of the broadband packet network;

b) means for conveying the PDU through the broadband packet network to an egress gateway; and

c) the egress gateway comprising:

i) means for extracting a respective container from each received PDU; and

ii) means for reconstructing the data stream using the respective containers.

83. A system as claimed in claim 82, wherein the means for receiving a data stream respecting the data service comprises an interface adapted to convey the data stream from a source to the ingress gatway.

84. A system as claimed in claim 82, wherein the means for encapsulating the data stream comprises:

a) means for accumulating a payload packet comprising a predetermined number of accumulated bytes of the data stream; and

b) means for encapsulating the payload packet within the container.

85. A system as claimed in claim 82, wherein the broadband packet network is based on any one or more of the UDP/IP, TCP/IP, IP-MPLS, ATM, Ethernet and DOCSIS protocols, and the data stream is formatted in accordance with any other communications protocol.

86. A system as claimed in claim 85, wherein a communications protocol of the data stream is known.

87. A system as claimed in claim 86, wherein the predetermined number of bytes of the data stream forming each payload packet is a function of the format of the data stream.

88. A system as claimed in claim 87, wherein the data stream is a circuit-switched data stream comprising pulse code modulated (PCM) signals, and the number of accumulated bytes forming each payload packet is determined by a number of channels and a number of multi-frames of the data stream.

89. A system as claimed in claim 88, wherein the number of accumulated bytes forming each payload packet is equivalent to

$$Ps = (Nc \times Nm) \times n$$

Where: Ps = payload packet size;

Nc = number of channels;

Nm = number of frames; and

n = an integer.

90. A system as claimed in claim 86, wherein the data stream is a packet data stream comprising sequential PDU's of a packet network protocol.

91. A system as claimed in claim 90, wherein the number of bytes forming each payload packet is an integer multiple of a number of bytes forming each PDU of the packet network protocol.

92. A system as claimed in claim 85, wherein a communications protocol of the data stream is unknown.

93. A system as claimed in claim 84, wherein the means for accumulating a payload packet comprises:

a) means for detecting an idle pattern; and

b) means responsive to detection of an idle pattern and adapted to discard bytes of the data stream corresponding to the detected idle pattern.

94. A system as claimed in claim 93, wherein the idle pattern in known.

95. A system as claimed in claim 94, wherein the idle pattern is embedded within the data stream, and the means for detecting the idle pattern comprises means for monitoring successively received bytes of the data stream to detect the idle pattern.

96. A system as claimed in claim 94, wherein idle pattern is indicative of an idle channel within the data stream, and the means for discarding bytes of the data stream comprises means for discarding bytes within the indicated idle channel of the data stream.

97. A system as claimed in claim 94, wherein the idle pattern is a stimulus external to the data stream.

98. A system as claimed in claim 94, further comprising means for forwarding an idle notification to the egress gateway, the idle notification comprising information identifying detected flags and corresponding idle channels.

99. A system as claimed in claim 98, wherein the notification is forwarded within the container.

100. A system as claimed in claim 98, wherein the notification is forwarded within a notification message independently of the container.

101. A system as claimed in claim 93, wherein the idle pattern in unknown.

102. A system as claimed in claim 101, wherein the means for detecting the idle pattern comprises means for monitoring each successive payload packet to detect a repeating pattern indicative of an idle condition of the circuit-switched data stream.

103. A system as claimed in claim 102, wherein the step of discarding bytes of the circuit-switched data stream

comprises a step of discarding each successive payload packet in which the repeating pattern is detected.

104. A system as claimed in claim 103, further comprising:

a) means for interrupting encapsulation of payload packets within containers, encapsulating containers within PDUs and forwarding the PDUs to the egress gateway; and

b) means for sending an idle notification to the egress gateway.

105. A system as claimed in claim 104, further comprising:

a) means for continuing to monitor successive payload packets to detect the repeating pattern; and

b) means for resuming the steps of encapsulating payload packets within containers, encapsulating containers within PDUs and forwarding PDUs to the egress gateway when the repeating pattern is no longer detected.

106. A system as claimed in claim 84, further comprising means for inserting a sequence number into each successive container.

107. A system as claimed in claim 106, wherein at least one sequence number is a reserved sequence number used to indicate a start of the data stream.

108. A system as claimed in claim 82, wherein the means for reconstructing the data stream comprises steps of:

a) a jitter buffer adapted to buffer each container;

b) means for extracting a respective payload packet from each buffered container; and

c) means for appending each extracted payload packet to a payload packet of a previous container to reconstruct the data stream.

109. A system as claimed in claim 108, further comprising means for sorting the buffered containers based on a respective sequence number of each container.

110. A system as claimed in claim 109, further comprising means for monitoring the respective sequence numbers of each buffered container to detect a missing container.

111. A system as claimed in claim 110, further comprising means for appending a null payload packet to a previous payload packet of the reconstructed data stream in respect of each detected missing container.

112. A system as claimed in claim 111, wherein the null payload packet comprises AB-bits duplicated from the previous payload packet of the reconstructed data stream.

113. A system as claimed in claim 108, further comprising:

a) means for monitoring an inter-packet delay period between successively received PDU's; and

b) means for adjusting a length of the jitter buffer based on the inter-packet delay.

114. A system as claimed in claim 113, wherein the length of the jitter buffer is adjusted during an idle period of the data stream.

115. A system as claimed in claim 82, wherein the means for reconstructing the data stream further comprises means for receiving an idle notification from the ingress gateway.

116. A system as claimed in claim 115, wherein the idle notification comprises information identifying one or more of an idle indication and a corresponding idle channel of the data stream received by the ingress gateway, and the means for reconstructing the data stream further comprises means for inserting null data into the corresponding idle channel of the reconstructed data stream in response to receipt of the idle indication.

117. A system as claimed in claim 116, wherein the null data includes the idle indication.

118. A system as claimed in claim 115, wherein the idle notification comprises an indication of an idle condition of the data stream received by the ingress gateway, and the means for reconstructing the data stream comprises means for duplicating a last

received payload packet in response to receipt of the idle notification.

119. A system as claimed in claim 115, wherein the notification is received by the egress gateway encapsulated within a container.

120. A system as claimed in claim 115, wherein the notification is received by the egress gateway within a notification message independently of a container.

121. A system as claimed in claim 115, further comprising means for resuming reconstruction of the data stream based on containers extracted from received PDU's upon receipt of a container having a predetermined reserved sequence number.